MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

BER2094 – ENVIRONMENTAL & RESOURCE ECONOMICS

(All Section/Group)

13 October 2015
2.30pm – 4.30pm
(2 Hours)

INSTRUCTION TO STUDENT

1. This question paper consists of **FIVE (5)** pages including cover page with Section A and B.
2. Section A consists of **One (1)** Case Study. Section B consists of **Three (3)** Structured Questions.
3. Attempt **ALL** questions.
4. Please write all the answers in the answer booklet provided.
5. The marks distribution for each question is given. Total marks 100.

SECTION A: CASE STUDY (40%)

State of water environmental issues in Malaysia

Water Environmental Partnership in Asia
http://www.wepa-db.net/policies/state/malaysia/overview.htm

Overview

The water pollution in Malaysia is originated from point sources and non-point sources. Point sources that have been identified include sewage treatment plants, manufacturing and agro-based industries and animal farms. Non-point sources are mainly diffused ones such as agricultural activities and surface runoffs. According to Malaysia Environment Quality Report 2004, the Department of Environment has recorded 17,991 water pollution point sources in 2004 comprising mainly sewage treatment plants (54%), manufacturing industries (38%), animal farms (5%) and agro-based industries (3%).

River Water

The Department of Environment (DOE) used Water Quality Index (WQI) to evaluate the status of the river water quality. The WQI serves as the basis for environment assessment of a watercourse in relation to pollution load categorization and designation of classes of beneficial uses as provided for under the National Water Quality Standards for Malaysia (NWQS). In 2006, a total of 1,064 water quality monitoring stations located within 146 river basins were monitored. Out of these 1,064 monitoring stations, 619 (58%) were found to be clean, 359 (34%) slightly polluted and 86 (8%) polluted. Stations located upstream were generally clean, while those downstream were either slightly polluted or polluted. In terms of river basin water quality, 80 river basins (55%) were clean, 59 (40%) slightly polluted and 7 (5%) were polluted. The major pollutants were Biochemical Oxygen Demand (BOD), Ammoniacal Nitrogen (NH3-N) and Suspended Solids (SS). In 2006, 22 river basins were categorized as being polluted by BOD, 41 river basins by NH3-N and 42 river basins by SS. High BOD was contributed largely by untreated or partially treated sewage and discharges from agro-based and manufacturing industries. The main sources of NH3-N were domestic sewage and livestock farming, whilst the sources for SS were mostly earthworks and land clearing activities.

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Analysis of heavy metals in 5,613 water samples revealed that almost all samples complied with Class III, National Water Quality Standards for arsenic (As), mercury (Hg), cadmium (Cd), chromium (Cr), lead (Pb) and zinc (Zn), except iron (Fe) with 83 percent compliance. Intensified enforcement efforts and good environmental management practices could also have contributed to the water quality improvement.

Ground water

The groundwater quality status was determined based on the National Guidelines for Raw Drinking Water Quality from the Ministry of Health (Revised December 2000) as the benchmark. By 2006, 88 monitoring wells had been established at 48 sites in Peninsular Malaysia, 19 wells in Sarawak and 15 wells in Sabah. The sites were selected and categorized according to the surrounding land uses which were agricultural, urban/suburban, rural, industrial, solid waste landfills, golf courses, radioactive landfill, animal burial areas, municipal water supply and examining areas (gold mine). In 2006, 340 water samples were taken from these monitoring wells compared to 250 in the previous year (2005). The samples were analysed for volatile organic compounds (VOCs), pesticides, heavy metals, anions, bacteria (coliform), phenolic compounds, radioactivity (Gross Alpha and Beta), total hardness, total dissolved solids (TDS), pH, temperature, conductivity and dissolved oxygen (DO). Iron (Fe) levels exceeding the benchmark were recorded in all samples. Between 30 percent and 100 percent of the samples taken from all sites showed high levels of iron. The sampling results also showed that between 15 percent and 100 percent of samples taken from all areas recorded manganese (Mn) levels exceeding the benchmark. Between 5 percent and 13 percent of samples in rural areas (5%), landfills (5%), municipal water supply (5%), golf courses (7%), agricultural areas (9%) and industrial areas (13%) were found to exceed the nitrate benchmark except in urban/suburban, ex-mining areas and radioactive landfills. Arsenic levels exceeding the benchmark were recorded at radioactive sites (100%), ex-mining areas (67%), solid waste landfill (44%), municipal water supply (36%) and agricultural areas (20%).

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Based on the above article, answer the following questions:

a)

i) Distinguish between point sources and non-point sources of water pollution. (3 marks)

ii) List and explain any **THREE (3)** factors that causes point sources and non-point sources of water pollution. (9 marks)

b) *In terms of river basin water quality, 80 river basins (55%) were clean, 59 (40%) slightly polluted and 7 (5%) were polluted. The major pollutants were Biochemical Oxygen Demand (BOD), Ammoniacal Nitrogen (NH3-N) and Suspended Solids (SS).*

List out **SIX (6)** main parameters computed in Water Quality Index (WQI) Malaysia. (6 marks)

c) *In 2006, 340 water samples were taken from these monitoring wells compared to 250 in the previous year (2005). Between 30 percent and 100 percent of the samples taken from all sites showed high levels of iron. The sampling results also showed that between 15 percent and 100 percent of samples taken from all areas recorded manganese (Mn) levels exceeding the benchmark.*

Suggest any **TWO (2)** actions need to be strictly implemented by the government to combat water pollution. (10 marks)

d) Choose the most suitable market-based approach for the decision makers to reduce water pollution in Malaysia. Discuss with suitable modeling. (12 marks)

SECTION B: STRUCTURED QUESTIONS (60%)

QUESTION 1 (20 marks)

a) Many researches have examined whether a technical relationship exists between economic growth and pollution. Discuss with a suitable diagram on how the Environmental Kuznets Curve (EKC) establish the relationship between economic growth and pollution. (10 marks)

b) Ali bought a set of new solar thermal panel energy recently. He is eligible for a one-time income tax credit up to $5,000. Show the effect of this tax credit graphically by assuming $5,000 is a Pigouvian subsidy. (10 marks)

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QUESTION 2 (20 marks)

a) The following equations have been estimated for hazardous waste services markets:

$$MSB = 30 - 2.5Q$$
$$MPC = 1.1 + 0.9Q$$
$$MSC = 1.5 + 1.25Q$$

Where, Q is thousands of tons per week, and the dollar values are per ton. Assume there are no consumption externalities in this market.

i. Express the equation that represents the negative externality in this market. (2 marks)

ii. Calculate the competitive equilibrium price and quantity. (2 marks)

iii. Calculate the socially optimal price and quantity (quantify the extent of the resource misallocation associated with the competitive solution). (4 marks)

iv. Estimate the dollar value of a unit waste-end charge that would restore the efficiency to this market. (2 marks)

b) The cartelization of the oil suppliers has been very effective in the world. Explain any **TWO (2)** factors that make oil cartelization possible. (10 marks)

QUESTION 3 (20 marks)

a) Food prices have risen 83 per cent since 2005, and jumped 47 per cent between January 2007 and January 2008 alone. Discuss any **FOUR (4)** causes of global food insecurity. (10 marks)

b) Two major manufacturers of refrigerants, Firm X and Firm Y face the following marginal abatement costs (MAC) for HCFCs.

$$MAC_X = 1.2A_X$$
$$MAC_Y = 1.8A_Y$$

A_X represents the quantity of abatement for Firm X and A_Y represents the quantity of abatement for Firm Y. In the aggregate, the two firms do not hold enough HCFC allowances to cover their production activity and must abate a combined level of 20 units.

Should each firm abate 10 units each? Economically explain your answer with MAC justification. Show all your working to support your answer.

(10 marks)

End of Paper